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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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PESTICIDES AND TOXIC
SUBSTANCESMEMORANDUM

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SUBJECT: Fipronil: Emergency Exemption Use on Rangeland in Wyoming :
Environmental Risk Assessment Conclusions

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The Environmental Fate and Effects Division has completed review of the potential environmental effects from the emergency exemptive use of fipronil to control grasshopper infestations in rangeland as proposed by the Wyoming Dept. of Agriculture.

Probability of risk to birds from such a low application rate (0.0036 lb ai/A) appears low to moderate for sensitive gallinaceous groups such as quail, partridge, grouse and pheasant. Songbird and waterfowl species appear to be less sensitive. This is based on direct oral consumption studies with 6 species and dietary studies with 2 species.

Based on current exposure and risk assessment methods and assumptions (runoff + 5% drift), exposure levels for aquatic organisms are not expected to exceed hazardous levels. The direct over flight of small freshwater habitats in grassland areas could result in 2.5 ppb levels of residues from direct drift. However, this type of scenario is prohibited on the label. Based on acute studies with daphnia, environmental levels of concern are about 19 ppb for acute and 9 ppb for chronic concerns to invertebrates. High levels of direct drift (e.g. 20%) could approach chronic concern levels for



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invertebrates. However, with adequate buffer zones this degree of drift deposition to aquatic habitats is not expected.

Fipronil is toxic to several insect families which may be beneficial in rangeland habitats. It is assumed that hazardous impacts to unprotected honeybees and other beneficial pollinator insects are probable as direct contact exposure to these insects is likely with aerial application. Dietary residue exposure to honeybees within a 48 hour period may also prove hazardous, even at these low rates of application based on oral toxicity from ingestion of residues.

Based on the environmental fate assessment, fipronil and its degradates (MB 46513, MB 46136 and MB 45950) can potentially move into surface waters. The persistence of parent fipronil ($t_{1/2}$ =128 to 300 days) and its transformation products ($t_{1/2}$ =700 days) may allow for a substantial fraction of fipronil residues to be available for runoff months after application. Fipronil and its transformation products have a moderate to high binding affinity (K_d values 4 to 20 mL/g) to mineral soils. Although fipronil and its degradates exhibit moderate soil sorption affinities, these compounds are expected to exist in runoff waters primarily in the dissolved state.

Based on GENEEC modeling, fipronil concentrations in surface water (2 meter depth) are not likely to exceed 0.06 for Day 0 (acute) and 0.02 ug/l for 56 day average (chronic). MB46136 concentrations are not likely to exceed 0.045 ug/L for Day 0(peak) and 0.018 ug/L for 56 day average (chronic). Concentrations of MB 46513 are not expected to exceed 0.016 ug/L for Day 0 (acute) and 0.010 ug/l for 56 day average (chronic). MB45950 is not expected to exceed 0.001 ug/L for Day 0 (acute) and 0.0005 ug/L for 56 day average (chronic). These residue levels, based on runoff with 5% aerial drift to a one hectare pond, do not exceed currently known acute or chronic toxicity levels of concern for freshwater organisms (the lowest is 6.0 ppb for fish NOEC(fipronil) and 0.6 for daphnia reproductive effects NOEC (MB46136)). Some exceedance would appear possible should drift occur to more shallow habitats of similar surface area. In addition, ULV aerial applications may lead to more significant drift (up to 20%) of the applied insecticide.

SCI-GROW modeling predicts that residue concentrations in groundwater are not likely to exceed 0.00056 ug/L for parent fipronil, 0.000027 ug/L for MB46136, 0.000298 ug/L for MB 46513, and 0.00001 ug/L for MB45950.

Further questions regarding this review may be directed to James Hetrick at 305-5237 or Brian Montague at 305-6438.

Special Exemption Request: State of Wyoming to control grasshoppers- May 1 to Sept. 1, 1999

Active Ingredient Name: Fipronil

Chemical Type: Phenylpyrazole insecticide

Shaughnessy Code: 129121

CAS #: 120068-37-3

Product Trade Names: Adonis Insecticide **%ai:** 0.45% (4g ai/L)

Proposed Application Methods: Single aerial application at 0.0036lbs ai/A- Alternating -1 swath treated and two swaths untreated (Reduced Agent-Area Treatment or RAAT)

Proposed Maximum Acreage: 100,000 acres within a 300,000 acre rangeland, non cropland or CRP land area. The location is not identified in any further detail.

Purpose: To control grasshoppers on rangeland to prevent reduction of food sources for domestic cattle.

I. Summary of Conclusions

Fipronil exemptive use for grasshopper control in Wyoming is not expected to seriously impact wildlife populations based on current OPP ecological risk methodology and despite the fact that fipronil is highly toxic to bobwhite quail and other gallinaceous species. Based on a single application at 0.0036 lb ai/A using Reduced Agent Area Treatment (RAAT) methods the maximum exposure levels within swaths (2.52 ppm) for proposed use of fipronil for grasshopper control on rangeland are expected to be below acute dietary levels of concern for bobwhite quail ($\frac{1}{2}$ LC50=24 ppm). Bobwhite are the most sensitive species tested thus far. Uncertainties in the risk assessment include incomplete toxicological profiles for fipronil and its degradates as well as uncertainty regarding the foliar dissipation characteristics of this chemical. Exposure to low levels of residues in soils or sediments is expected to continue from one season to another if continuous annual usage is adopted.

The Agency agrees with the Wyoming Dept. of Fish and Game that substantial buffer zones should be included on this special exemption label to prevent possible spray drift to non-target aquatic habitats. The state has suggested a 500 foot buffer zone. The Agency recommends that at least 2-4 untreated swaths (200-400 feet) be incorporated into treatment procedures for protection of streams, prairie potholes, wetlands, bogs, ponds, and lakes when located near treatment areas.

Based on GENEEC modeling, fipronil concentrations in surface water (2 meter depth) are not likely to exceed 0.06 for Day 0 (acute) and 0.02 ug/l for 56 day average (chronic). MB46136 concentrations are not likely to exceed 0.045 ug/L for Day 0(peak) and 0.018 ug/L for 56 day average (chronic). Concentrations of MB 46513 are not expected to exceed 0.016 ug/L for Day 0 (acute) and 0.010 ug/l for 56 day average (chronic). MB45950 is not expected to exceed 0.001 ug/L for Day 0 (acute) and 0.0005 ug/L for 56 day average (chronic). These residue levels, based on runoff with 5% aerial drift to a one hectare pond, do not exceed currently known acute or chronic toxicity levels of concern for freshwater organisms (the lowest is 6.0 ppb for fish NOEC(fipronil) and 0.6 for daphnia reproductive effects NOEC (MB46136)). Some exceedance would appear possible should drift occur to more shallow habitats of similar surface area. In addition, ULV aerial applications may lead to more significant drift (up to 20%) of the applied insecticide.

SCI-GROW modeling predicts that residue concentrations in groundwater are not likely to exceed 0.00056 ug/L for parent fipronil, 0.000027 ug/L for MB46136, 0.000298 ug/L for MB 46513, and 0.00001 ug/L for MB45950.

Fipronil displays one of the highest levels of toxicity to honeybees ever reviewed by the Agency (contact LD50= 0.00593 ug ai/bee and oral LD50= 0.004 ug ai/bee). Based on this information it is predicted that potential hazard to populations of pollinator insects in treated and adjacent untreated areas may be experienced with even very low application rates of fipronil. The one mile buffer zone restrictions for registered apiaries will not protect natural populations of pollinators or other non-target insects which may be present on application sites and severely impacted by aerial applications of fipronil. In recent studies of grasshopper control in Mauritania, non-target Hymenoptera and Coleoptera were also severely impacted indicating that high mortality in other nontarget insect groups can be expected (Balanca G.: de Visscher M. Archives of Environmental Contamination and Toxicology. 1997 Jan; 32(1):58-62.).

II. Background

Application for this emergency exemption follows completion of a 1997 EUP study to assess the efficacy of fipronil, carbaryl, and malathion for grasshopper control using reduced agent area treatment (RAAT) procedures.

III. Environmental Fate Summary

Based on supplemental and acceptable data, fipronil dissipation appears to be dependent on photodegradation in water, microbially mediated degradation, and soil binding. Fipronil is relatively persistent and immobile in terrestrial environments. In aquatic environments, a determination of the environmental behavior of fipronil is more tentative because soil and aquatic metabolism studies provide contradictory data on fipronil persistence to microbially mediated degradative processes. Photolysis is expected to be major factor in controlling fipronil dissipation in aquatic environments. Fipronil degrades to form persistent and immobile degradates. Since fipronil and its degradates have a moderate to high sorption affinity to soil, it is likely soil sorption will control fipronil residue movement into ground and surface waters. Fipronil and its degradates, however, have the potential to move in very vulnerable soils (*e.g.*, coarse-textured soils with low organic matter content).

IV. Water Resource Summary

A. Surface Water Assessment

Based on the environmental fate assessment, fipronil and its degradates (MB 46513, MB 46136 and MB 45950) can potentially move into surface waters. The persistence of parent fipronil ($t_{1/2}$ =128 to 300 days) and its transformation products ($t_{1/2}$ =700 days) may allow for a substantial fraction of

fipronil residues to be available for runoff months after application. Fipronil and its transformation products have a moderate to high binding affinity (K_d values 4 to 20 mL/g) to mineral soils. Although fipronil and its degradates exhibit moderate soil sorption affinities, these compounds are expected to exist in runoff waters primarily in the dissolved state.

The dissipation of fipronil in surface water should be dependent on photodegradation in water ($t_{1/2}$ = 3.63 hours) and, to a lesser extent, microbial-mediated degradation ($t_{1/2}$ = 128 and 300 days for aerobic soil; 116 to 130 days for anaerobic aquatic; 14 days for aerobic aquatic metabolism). Since photodegradation is a major route of degradation for fipronil, its dissipation is expected to be dependent on physical components of the water (i.e. sediment loading) which affect sunlight penetration. Foliar-applied fipronil also is expected to photodegrade. For example, fipronil is expected to degrade faster in clear, shallow water bodies than in murky and/or deeper waters. Since fipronil and its transformation products have moderate soil-water partitioning coefficients, binding to sediments may also be a route of dissipation.

The following data were used as input for the GENEEC modeling of fipronil:

<u>Parameter</u>	<u>Value</u>	<u>Source</u>
Soil K_{oc}	727 mL/g ¹	MRID 44039003
Aerobic soil half-life	128 days	MRID 42918663
Photolysis half-life	0.16 days	MRID 42918661
Hydrolysis pH 7	Stable	MRID 42194701
Aerobic Aquatic half-life	Stable ²	
water solubility	2.4 mg/L	EFGWB one-liner

1- Mean Koc value.

2- Fipronil is considered to be stable in aerobic aquatic environments because the aerobic aquatic metabolism study (MRID 44261909) was deemed as supplemental data.

Based on the Tier 1 GENEEC surface water modeling, the maximum fipronil concentration in surface water is not likely to exceed 0.0603 µg/L (Table 1).

Table 1: Fipronil EECs for Use on Rangeland, Non-Crop Land, and CRP Land

GENEEC (µg/L) Parent and Degradate	Peak EEC	4-day EEC	21 day EEC	56-day EEC
Parent Fipronil	0.0603	0.0565	0.0393	0.0222
MB 46136	0.0045	0.0041	0.0027	0.0018
MB 46513	0.0157	0.0151	0.0129	0.0104
MB 45950	0.0010	0.0010	0.0007	0.0005

*1 in 10 year EECs are reported.

The lowest reported half-life of fipronil ($t_{1/2}$ = 128 days) was used as the representative aerobic soil metabolism half-life of fipronil. Preliminary analysis indicates the upper 90th percentile half-life value of the mean is much greater than the highest reported value ($t_{1/2}$ = 308 days). The highest reported half-life is associated with a low organic matter sand, which likely represents a soil type of limited microbial activity. It should be noted that the use of the lowest half-life is a departure from current EFED policy, which states that the 90th percentile of the mean should be used for modeling purposes. However, the use of the lower half-life is not expected to alter GENEEC predictions because the model is relatively insensitive with respect to this parameter for moderately to persistent compounds.

In the GENEEC modeling, fipronil is assumed to be stable in aerobic aquatic environments. This assumption was used because the aerobic aquatic metabolism data for fipronil was deemed as supplemental. EFED notes that rapid degradation of fipronil ($t_{1/2}$ = 14 days) in the aerobic aquatic metabolism study is inconsistent with both aerobic soil metabolism and anaerobic aquatic metabolism data on fipronil. Additionally, interpretation of the study results are further confounded by a highly stratified redox potential between the water and sediment phases. Therefore, a conservative assumption of fipronil stability was used for GENEEC.

EFED conducted Tier 1 surface water modeling for the individual degradates including MB 46513, MB 46136 and MB45950. Environmental fate properties of the fipronil degradates are shown in Table 2. EFED notes the environmental fate data for MB 46136 and MB 45950 were taken from interim reports. Preliminary review of interim data suggest it should be satisfactory to fulfill data gaps in comprehensive environmental fate assessment. EFED, however, reserves final judgment on data acceptability pending review of final data submissions.

Table 2: Fate Properties of Fipronil Degradates

Fate Parameter	MB 46136	MB 46513	MB 45950
Mean Koc	4208 mL/g	1290 mL/g	2719 mL/g
Aerobic Soil Metabolism Half-life	Stable	Stable	Stable
Aqueous Photolysis Half-life	7 days	Stable	Stable
Hydrolysis Half-life	Stable	Stable	Stable
Aerobic Aquatic Metabolism Half-life	Stable	Stable	Stable
Water Solubility	0.16 mg/L	0.95 mg/L	0.1 mg/L
Application Rate* (lbs a.i./A)	0.00105	0.0015	0.000175
References	RP# 201555 ACD/EAS/Im/255 Theissen 10/97	44262831 44262830 42918661 Theissen 10/97	RP 201578 Theissen 10/97

*based on percent of degradate formation in aerobic soil metabolism and photodegradation in water studies for an application rate of 0.0035 lbs ai/A.

Based on the Tier 1 GENEEC surface water modeling, the maximum concentration of fipronil residues in surface water is not likely to exceed 0.168 µg/L for MB 46136, 0.014 µg/L for MB 46513, and 0.039 µg/L for MB 45950 (Table 3). The EECs for the individual fipronil degradates are highly dependent on the application rate. Since the individual fipronil transformation products represent only a fraction of the applied fipronil, the application rates of the fipronil degradates are representative of maximum percentage of degradate formation in aerobic soil metabolism studies. EFED notes that MB 46513 and MB 45950 are not major aerobic soil degradates of fipronil. A major photodegradate of fipronil, MB 46513, is expected to be major degradate for foliar-applied fipronil. The degradate MB 45950 appears to be formed in anoxic to suboxic environments. These conditions are not likely to be representative of most surface soils.

Uncertainties in the surface water assessment include: 1.) the actual degradation rate of fipronil in aquatic environments, 2.) the limited environmental fate data for fipronil degradates, 3.) The inability to model a Reduced Agent and Area Treated (RAAT), and 4.) the inability to account for foliar dissipation. The lack of acceptable aerobic aquatic metabolism data prevents a complete assessment of fipronil degradation in aquatic environments. Contradiction of fipronil half-lives among the various metabolism studies needs to be addressed by the registrant. The lack of metabolism half-lives for fipronil degradates also limits confidence in prediction of environmental

concentrations. The absence of or low confidence in the metabolism data dictated the conservative assumption that degradates are "stable" in aquatic and terrestrial environments. Such an assumption suggests that fipronil residues could potentially accumulate in terrestrial or aquatic environments. Inherent in the modeling is the assumption that RAAT management of fipronil will result in similar runoff as broadcast applied fipronil. It is anticipated that runoff from broadcast application is expected to be higher than RAAT because the untreated swath in the RAAT is expected to serve as a buffer strip, which will reduce runoff. Since foliar degradation is not considered in the GENEEC modeling, it is assumed that foliar degradation of fipronil can be predicted using the aerobic soil metabolism half-life.

GROUND WATER ASSESSMENT

The environmental fate data for fipronil indicate a moderate to high persistence and relatively low mobility in terrestrial environments. Based on the SCI-GRO model, acute drinking water concentrations in shallow ground water on highly vulnerable sites are not likely to exceed 0.00056 µg/L for parent fipronil, 0.000027 µg/L for MB 46136, 0.000298 µg/L for MB 46513, and 0.000010 µg/L for MB 45950. Chronic concentrations are not expected to be higher than acute values. Highly vulnerable sites are those with low organic matter, coarse textured soils (e.g., sands and loamy sands) and shallow ground water. The fate data for fipronil and its degradates indicate a higher potential mobility on coarse-textured soils (sand or loamy sands). Fipronil and its degradates may pose a threat to ground water contamination within these sensitive areas.

1) Ecological Exposure

Mode of Action: According to the manufacture's data, fipronil affects the gamma-aminobutyric acid neurotransmission system by interfering with the passage of chloride. In addition, research data indicate that fipronil displays a higher potency in insect GABA chloride channel than in vertebrate GABA chloride channel which may indicate selective toxicity (Cole, Loretta, Russell A. Nicholson, and John E. Casida. 1993. Action of Phenylpyrazole Insecticides at GABA-gated Chloride Channel. Pesticide Biochemistry and Physiology, 46:47-54)

V. Aquatic Organism Risk Assessment

Based on very low expected environmental concentrations predicted by screen models no adverse effects to fish or aquatic invertebrates are predicted for acute or chronic exposures, despite the highly toxic activity of fipronil to these groups. See table 3 below for actual risk quotients.

Based on the limited data aquatic plant species are not expected to be significantly effected at concentrations of up to 100 ug/L. This is far above any predicted concentrations for rangeland

use.

Table 1 presented earlier in this document illustrates the GENEEC EECs used in calculating risk quotients (RQs) presented below. RQs of 0.5 are considered hazardous. RQs of 0.2 are considered high enough to require restricted use. RQs of 0.1 represent levels of concern for endangered species. None of the RQs below exceed 0.1. EEC concentrations are based on runoff and drift to a 1 hectare 2 meter deep pond.

Table 3 Freshwater Organism Toxicity/Hazard Estimates					
Species	% A.I.	LC50 Range in ppb	MRID	Acute RQ Range	Chronic RQ
Bluegill /Trout	100 Tech.	83 to 246	429186-24 42977902	0.0007 to 0.0002	
		NOEC=6.6	429186-27		0.003
Bluegill /Trout	99.2 deg. (MB46136)	25 to 39	42918674 429186-73	0.00018	
Bluegill / Trout	MB46513	20 to 31	unreviewed	0.0007	
Daphnia magna	100 Technical	39 to 190	429186-26 429186-25	0.001 to 0.0003	
		NOEC =9.8	429186-26		0.004
Daphnia magna	100% MB 46136	29	429186-71	0.00015	
		NOEC=0.63	invalid study		0.004
Daphnia magna	*100% MB 45950	100	429186-69	0.0002	
		NOEC=13	invalid study		0.001
Daphnia magna	MB 46513	NOEC=41	in review		0.0003
<i>Selenastrum c.</i> (FW green alga)	96.1	140 PPB	42918660	0.0004	
Estuarine Organism Toxicity (not pertinent to Wyoming use)					

The results of the 96-hour acute toxicity studies indicate that fipronil parent and degradates are very highly or highly toxic fish. Early life stage results indicate that fipronil affects larval growth at concentrations of greater than 6.6 ug/L but less than 15 ug/L in rainbow trout.

There is sufficient information to characterize the fipronil parent as well as the MB46136 and

MB45950 degrades as very highly acutely toxic to freshwater aquatic invertebrates. There is sufficient information to characterize fipronil as highly acutely toxic to oysters and very highly toxic to mysids. The results indicate that fipronil affects growth in daphnids at concentrations exceeding 9.8 ug/L (42918626). Fipronil affects reproduction, survival and growth in mysids at concentrations less than 0.005 ug/L (436812-01).

VI. Terrestrial Animal Risk Assessment

Estimated Terrestrial Environmental Concentrations and Their Duration:

Terrestrial Food Sources: Estimated concentrations on various surfaces from a single application of fipronil at maximum labeled rate of 0.0036 lbs ai/Acre would result in the following residue levels on soil or vegetation (Based on Kenaga and Fletcher values) within the treated swaths. Use of the swath method would concentrate the listed rate into the treated swath (in other words 3 times application rate in the treated swath). Since fipronil is moderately persistent in soil, fipronil is likely to degrade through photodegradation on leaf surfaces.

Estimated Environmental Concentrations on Vegetation in Treated Swaths			
No. Applications/Interval Days	Range Grass	Foliage/Insects	Seeds/Fruit
1 application/NA	Max.= 2.52* Typical= 1.31	Max.= 0.6 Typical.= 0.34	Max.= 0.07 Typical= 0.015

*This residue level assumes that the application rate per acre would be concentrated into the treated swath. $0.0036 \times 240 \text{ p.m. (Kenaga and Fletcher)} = 0.864 \times 3 = 2.52 \text{ p.m.}$

Avian Toxicity Data

Based on the maximum predicted residue levels from application of fipronil at 0.0036 lbs ai/A (potentially 2.5 p.m. on short grass in the swath) dietary and acute oral hazard is not expected, despite the high toxicity of this compound to gallinaceous birds. Maximum expected residues on grasshoppers in the swath would be far less than that on grassy vegetative surfaces (about 0.162 p.m. using Fletcher values of 15 p.m. on large insects per lb ai applied). Thus, to reach the LC50 of 48 p.m. for bobwhite quail would require ingestion of over 200 grasshoppers within the treated swath. This would seem unlikely.

The acute oral toxicity data for birds exposed to fipronil soil insecticide displays extremely variable oral toxicity dependent on the species tested. It is very highly toxic to some species, yet nearly non-toxic to the mallard duck. The degradate MB 46513 is 2 times more orally toxic to bobwhite quail than the parent compound and was moderately toxic to the mallard duck.

The avian dietary study results indicate that fipronil is very highly toxic to bobwhite quail on a subacute dietary basis, yet is practically non-toxic to mallard duck on a subacute basis. The number of species tested in dietary studies is much less than the extensive oral acute testing for fipronil. Therefore, it is not certain whether the wide species sensitivity seen in oral testing would also be displayed in dietary studies. The reviewing scientist assumes that this may be a possibility

that must be considered in assessing potential risk. In addition, no data regarding the dietary toxicity of degradates to avian wildlife species was provided. As oral toxicity to bobwhite was higher for MB 46513, the Agency is also concerned that dietary toxicity may also be higher for other metabolites of fipronil.

Avian Acute Oral, Sublethal Dietary and Chronic Toxicity/Hazard Findings					
Species Tested	% ai	LD50, LC50 NOEL	MRID	Acute RQ Range	Chronic RQ
Northern bobwhite Pheasant Red-legged partridge House sparrow Pigeon Mallard	95-98	LD50=11.3 mg ai/Kg 31 34 1000 >500 >2150	429186-17 429186-14 429186-15 429186-18 429186-13 429186-16	Not a granular Application	NA
Northern bobwhite and mallard	99.7 MB46513	LD50=5 to 420 mg ai/Kg	437766-01 437766-02		
Northern bobwhite	1.6 WG	LD50=1065	429186-19		
Northern bobwhite and Mallard	95% Tech.	LC50=48.0 LC20=35 LC50 >5000	429186-20 429186-21	0.03 to 0.001 <0.0002	
Northern Bobwhite	96.7 Tech.	NOEL <10	429186-22	NA	>0.25
Mallard Duck	96.7 Tech.	NOEL >1000	429186-23	NA	<0.0008

Oral Tests * 30% mortality at 10 mg/Kg and 0% mortality at 4.6 mg/Kg. NOEL=1 mg/Kg

Dietary Tests* 20% mortality at 35 p.m. and 0% mortality at 16 p.m.(NOEL).

The avian reproductive studies indicate that fipronil had no effects at the highest levels that were tested in mallard (NOEC=1000 ppm) and bobwhite quail (10 ppm). Based on estimated residue levels for grassy surfaces this 10 ppm level would require a single application at 0.05 lbs ai/A which is well below the 0.0036 lbs ai/A proposed for rangeland grasshopper control. Chronic exposure levels are not expected to be exceeded for this proposed use.

Mammalian Toxicity

Based on low estimated residue levels and dietary toxicity estimates extrapolated from oral toxicity values, residue levels from a single application at 0.0036 lb ai/A are not expected to reach levels of concern for acute toxicity to mammals.

Mammalian Acute Oral Toxicity Findings						
Species	% AI	LD ₅₀ (mg/kg)		MRID	LD50 to LC50 conversion	Dietary RQ from 0.894 ppm
Rat (small mammal)	93%	97 mg/kg		429186-28	1940 ppm	0.004

Acute oral LD₅₀ from the Agency's Health Effects Division (HED) is used to determine toxicity to mammals (HED Tox Oneliners). The available mammalian data indicate that fipronil (technical) is moderately toxic to small mammals on an acute oral basis. The 1.6% and 0.25% formulations demonstrated lower mammalian dietary toxicity than the parent.

Toxicity to Non-Target Beneficial Insects

Species	Study Type	Toxicity ug ai/bee	MRID	Category
Apis mellifera	Acute contact	LD50=0.00593	in review	extremely high
Apis mellifera	Acute oral	LD50=0.00417	in review	extremely high
Apis mellifera	Foliar Contact	No data	No data	

The Agency has reviewed data regarding the foliar contact toxicity of fipronil to honeybees or other non-target beneficial insects. This pesticide is extremely toxic to honeybees, both from direct contact and from oral ingestion of residues. Label warnings do advise that fipronil is highly toxic to honeybees.

VII. Summary of Potential Risk

Likelihood of Exposure

Characterization of risk to non-target species is based on the expected environmental concentrations, the potential for exposure to non-target organisms from the proposed use and the known toxicity levels of this compound and its degradates to the various species expected to be exposed in or near the application site. Based on the proposed aerial application to grasslands a large number of terrestrial and aquatic species are likely to be exposed. A major concern for dietary exposure is in regard to bird or mammalian species who feed heavily on insect populations common to rangeland areas (see avian species of concern under endangered species section of this document). The most sensitive avian species groups tested, the quail, partridge, and the pheasant are known to display this type of activity and are common in these areas.

Characterization of Avian and Mammalian Risk from Potential Exposure

Chronic effects LOC levels for birds were not exceeded by a single application at 0.0036 lb ai/A if the terrestrial avian chronic levels of concern are assumed to be 10 ppm. Dietary acute LOC levels (24 ppm) are also not exceeded by a single application at this low rate. The proposed application rate of only 0.0036 lb ai within the treatment swath does not exceed levels of concern for non-listed avian species. Risks to mammals from dietary exposure are not expected to be high based on laboratory rat data. Risk quotients would likely be higher for such high metabolism mammals as shrews.

Numerous songbirds, gallinaceous birds, and migrating waterfowl are dependent on invertebrate populations as a food source in the diet of young and adult birds. Fipronil is highly toxic to fish and invertebrate species and reductions of these avian food sources may result from drift to shallow aquatic habitats.

Characterization of Non-target Insect Exposure Risk

The Agency cannot completely characterize the risk of adverse impacts to beneficial insects from application of fipronil insecticide products as a complete characterization of exposure to insects is generally not available. Fipronil is toxic to other insect families which may be beneficial in rangeland habitats. It is assumed that hazardous impacts to honeybees and other beneficial pollinator insects are probable as direct contact exposure to these insects is likely with aerial application if done in daylight hours. Dietary residue exposure to honeybees within a 48 hour period may also prove hazardous, even at these low rates of application based on oral toxicity from ingestion of residues.

Characterization of Risk to Aquatic Organisms from Potential Exposure

The proposed use of Fipronil on rangelands through the use of aerial application methods may present a high acute risk to aquatic species if exposed to direct spray drift in shallow habitats. A 20% drift from ULV aerial application on 10 hectare watershed to 2 meter/1 hectare pond would yield approximately 0.4 ppb concentration of parent ($0.0036 \text{ lb ai/A} \times 10 \text{ hectares} \times 20\% \times 61 \text{ ppb per lb applied}$). A pond or marsh of 1 meter depth and similar surface area could conceivably reach 0.88 ppb. Chronic effects to invertebrates and possibly very sensitive fish species are possible due to the persistence of fipronil and its metabolites in water. Therefore, if Fipronil drifts to bodies of water during application to rangeland, some invertebrate species may be adversely impacted. Levels of concern are not likely to be exceeded from runoff of residues from single applications at the low rates proposed for this use. Though the MB46136 degradate has been shown to be more toxic to freshwater fish and invertebrates, the estimated concentrations fall below what would be needed to cause hazardous exposure.

The EC_{50} for the aquatic plant species tested to date and the estimated aquatic concentrations from the proposed use on rangeland will not exceed acute toxicity concern levels for aquatic plants.

Probability of risk: Probability of risk to birds from such low application rates appears low to moderate for sensitive gallinaceous groups such as quail, partridge, grouse and pheasant.

Songbird and waterfowl species appear to be less sensitive. This is based on direct oral consumption studies with 6 species and dietary studies with 2 species. The direct over flight of small freshwater habitats in grassland areas could result in 2.5 ppb levels of residues from direct drift. However, this type of scenario is prohibited on the label. Based on acute studies with daphnia, environmental levels of concern are about 19 ppb for acute and 9 ppb for chronic concerns to invertebrates. High levels of direct drift (e.g. 20%) could approach chronic concern levels for invertebrates. However, with adequate buffer zones this degree of drift deposition to aquatic habitats is not expected.

VIII. Endangered or Declining Species

Fipronil aerial applications to rangeland do offer potential dietary exposure to sensitive endangered avian species feeding in these areas. Within the grasslands insectivorous birds and small mammals, such as field mice or voles, feeding on insects may be subject to ingestion of residues. Avian sensitivity is expected to be extremely species dependent as it was with bobwhite and mallard. Endangered species concern levels (based on 1/10 the LC50 of the bobwhite quail) would be 4.8 ppm. The maximum expected residues in the treatment swath are 2.5 ppm. Thus, an endangered species would need to be twice as sensitive as the most sensitive species tested. This would appear unlikely with the presently federally listed species in Wyoming (peregrine falcon, bald eagle, whooping crane, and eskimo curlew (rare visitor)) Additional species of concern listed in a March 16 1999 letter from the Fish and Wildlife Service include a number of rangeland species dependent on insects or invertebrates. These form approximately 80% of the diets of the following rangeland species.

Ferruginous hawk	Burrowing owl	Loggerhead shrike	Brewers sparrow
McCown's longspur	Mountain plover	Short-eared owl	Dickcissel
Lark bunting	Upland sandpiper	Veery	Chesnut collared longspur
Cassin's sparrow	Grasshopper sparrow	Long-billed curlew	Sprague's pipit
Baird's sparrow			

Listed mammalian species include Black footed ferret, Gray wolf and Grizzly bear which are unlikely to be effected.

The use of fipronil on rangelands is expected to offer potential hazard to early life stages of listed aquatic invertebrates or fish located in surface or subterranean waters. Little breakdown is expected if fipronil reaches subterranean water systems due to the absence of the primary source of degradation-exposure to sunlight. Shallow stream organism may be less effected if waters are clear, rapidly moving, and exposed to sunlight. Concentration in shaded pools could cause a exposure to potentially hazardous residues for sensitive species of fish or invertebrates though this scenario seems less likely in rangeland situations. The Wyoming toad, Colorado squawfish, and Kendall Warm Springs Dace are listed aquatic species in Wyoming. Known spawning habitats for these species must be avoided.

The Endangered Species Protection Program is expected to become final sometime in the near

future. Limitations in the use of Fipronil may be required to protect endangered and threatened species, but these limitations have not been defined and may be formulation and location specific. EPA anticipates that a consultation with the Fish and Wildlife Service will be conducted in accordance with the species-based priority approach described in the Program. Modifications would most likely consist of the generic label statement referring pesticide users to use limitations contained in county bulletins. For the present, the reviewer has included a listing of endangered species likely to be exposed and possibly vulnerable to the proposed uses of fipronil on rangeland. This listing is included as a reference for potential risk mitigation on a case by case basis.

IX. Recommended Label Restrictions

The following restrictions have been placed on the label for Adonis use on rangeland.

1. No fipronil use on rangeland where dairy cattle will graze is permitted.
2. No fipronil use is permitted on CRP land which will be harvested during the treatment year.
3. Fipronil may not be applied within 1 mile of a registered apiary.
4. Fipronil must be applied using RAAT application methods at 1 swath per 3 aerial swaths.
5. Do not apply fipronil when wind speeds exceed 10 mph.

In addition, the Agency recommends that the proposed 200 foot wide untreated swaths be doubled to 400 feet when positioned directly adjacent to water resources within the treatment area. The Wyoming Dept. of Fish and Game has requested a 500 foot buffer zone for ground and ½ mile buffer for aerial applications and this appears on proposed labeling below. Wind direction should never be toward aquatic habitats and should be less than 10 mph (Wyoming Fish and Game has requested 5 mph wind speed limitation).

Environmental Hazard Statement (excerpted from Adonis label)

Adonis Insecticide

This pesticide is toxic to birds and aquatic and estuarine organisms (fish and invertebrates). Do not apply directly to water, or to areas where surface water is present. Runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment wash water. Do not apply within 500 feet of naturally occurring water or within 1 mile of registered apiary locations. This pesticide is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if honey or leafcutter bees are visiting the treatment area. This pesticide also meets the criteria for classification as a **Restricted Use Pesticide** with regard to risks to estuarine invertebrates and birds (40 CFR 152.170 (c)(1)(iii)), and with regard to an avian acute oral toxicity value less than 50mg/kg for a granular product (LD50 for Bobwhite Quail=11.3 mg/kg) (40 CFR 152.170 (c)(2)(I)).

2. Environmental Risk Comparative Analysis for alternatives

Toxicity/Hazard Estimates				
Species	% A.I.	Fipronil	Malathion	Carbaryl
Application Rate		0.0035 lbs ai/A	1.5 lb ai/ A	1.25 lb ai/A
Max. Direct EEC-6ft		0.21 ppb	91.5 ppb	76.25 ppb
Bluegill /Trout LC50	100 Tech.	83 to 246 ppb	20 to 4 ppb	5047 to 1200 ppb
Daphnia magna EC50	100 Technical	39 to 190 PPB	1.0 ppb	5.6 ppb
EEC/LC50 Fish/Invert.		0.002/0.005	23/91	0.06/13.6
Max. 21 Day EEC	technical	0.0393 ppb	16 ppb**	
Daphnia magna chronic	100 Tech	NOEC=9.8 ppb	NOEC=0.06 ppb	NOEC=3.3 ppb
Max 56 Day EEC		0.0222 ppb	6 ppb**	
Rainbow trout chronic	96.7 Tech.	NOEC=6.6 PPB	NOEC=2 ppb	NOEC=210 ppb
<i>Selenastrum c.</i> (FW green alga)	96.1	140 PPB		
Terrestrial Species				
Northern bobwhite Pheasant Red-legged partridge House sparrow Pigeon Mallard	95-98	11.3 mg ai/Kg 31 34 1000 >500 >2150	167 mg/Kg — 1485 mg/kg	2000 mg/kg 1000 mg/Kg 2564 mg/kg
Max Range Grass EEC		2.5 ppm	360 ppm	300 ppm
Northern bobwhite and Mallard	95% Tech.	LC50=48.0 LC50>5000	3497 ppm >5000 ppm	>5000 ppm >5000 ppm
EEC/LC50 Bobwhite =RQ		0.05	0.10	>0.06
Max 90 Day Range grass EEC				
Northern Bobwhite	96.7 Tech.	NOEL <10	110 ppm	3000 ppm
Honeybee Contact LD50		0.0059 ugai/bee	0.2 ug ai/bee	1.3 ug ai/bee

* Studies used aerobic metabolic degradates/metabolites of Fipronil. Oral Tests * 30% mortality at 10 mg/Kg and 0% mortality at 4.6 mg/Kg. NOEL=1 mg/Kg Dietary Tests* 20% mortality at 35 ppm and 0% mortality at 16 ppm(NOEL).

** GENECC estimates from Malathion RED document

DP BARCODE: D253226

CASE: 291043
SUBMISSION: S556565

DATA PACKAGE RECORD
BEAN SHEET

DATE: 02/25/99
Page 1 of 1

*Reviewer
copy*

* * * CASE/SUBMISSION INFORMATION * * *

CASE TYPE: EMERGENCY EXEMP ACTION: 510 SEC18-OC F/F USE
RANKING : 0 POINTS ()
CHEMICALS: 129121 Fipronil

ID#: 99WY0002

COMPANY:

PRODUCT MANAGER: 05 ROBERT FORREST 703-308-9376 ROOM: CM2 248
PM TEAM REVIEWER: STEPHEN SCHAIBLE 703-308-9362 ROOM: CM2 267
RECEIVED DATE: 02/11/99 DUE OUT DATE: 04/02/99

* * * DATA PACKAGE INFORMATION * * *

DP BARCODE: 253226 EXPEDITE: N DATE SENT: 02/12/99 DATE RET.: / /
CHEMICAL: 129121 Fipronil
DP TYPE: 001

CSF: N LABEL: Y
ASSIGNED TO DATE IN DATE OUT ADMIN DUE DATE: 03/04/99
DIV : EFED 02/25/99 / / NEGOT DATE: / /
BRAN: ERB 02/25/99 / / PROJ DATE: / /
SECT: IO 02/25/99 / /
REVR : 02/25/99 / /
CONTR: / /

*1997, 1998 Fipronil tests of
Fipronil to be sent to
state. Will be from
to EFED.*

* * * DATA REVIEW INSTRUCTIONS * * *

Please review this section 18 request from Wyoming to use fipronil to control grasshoppers on rangeland, non-crop land, and CRP land. This is the first year this use has been requested. Please indicate if exposure to non-target organisms, including endangered or threatened species, is of concern. In addition, please indicate if there are any environmental fate or groundwater concerns. Please provide acute and chronic drinking water screening values for surface water and groundwater to HED/RAB1 (Olga Odiott, 605-0510). If I can be of help, please call. Steve Schaible (308-9362)

* * * DATA PACKAGE EVALUATION * * *

No evaluation is written for this data package

* * * ADDITIONAL DATA PACKAGES FOR THIS SUBMISSION * * *

DP BC	BRANCH/SECTION	DATE OUT	DUE BACK	INS	CSF	LABEL
253651		02/25/99	03/17/99	Y	N	Y
253653	EAB/IO	02/25/99	03/17/99	Y	N	Y
253654	HIB/IO	02/25/99	03/17/99	Y	N	Y